

# keeping

# CURRENT

March 2005



**WANTED:**  
One-utility  
transmission  
for the  
Pacific  
Northwest

BONNEVILLE  
POWER ADMINISTRATION



**B**PA has invested more than \$1 billion in its high-voltage transmission system in the last few years. It's developing new power and transmission products to help wind farmers get their product to market. BPA's grid is known for its reliability; the agency is proud of its reputation as a world-class transmission designer, builder and operator.

So, why does BPA believe a new approach is needed to better operate and plan the transmission grid in the Pacific Northwest?

Problems facing the transmission grid today go beyond the borders of any one utility. More than 20 generating and transmitting utilities rely on a single Northwest grid that is managed by 17 control area operators.

BPA believes the Northwest needs an effective one-utility approach to transmission to:

- assure high reliability in the future,
- increase efficiency, and
- assure timely construction of needed infrastructure.

A BPA-focused solution cannot fully address these problems and needs. BPA is motivated to work with others to find a solution that can capture these benefits for all the citizens of the Northwest.

## New uses in an old grid

**T**he use of the grid has changed dramatically in the last decade. Following the passage of the Energy Policy Act of 1992 and subsequent Federal Energy Regulatory Commission orders, the U.S. wholesale power market was altered significantly. Marketers and new owners of power plants gained new abilities to sell power to distant buyers over the existing transmission system. Power flow patterns changed as utilities relied increasingly on market purchases from distant sellers.

Unfortunately, a number of aluminum plants and other energy-intensive factories have closed due to worldwide competition and rising electricity prices, further changing where electricity is needed and where it flows.

At the same time, sheer demand for electricity is growing with the population, while investment in new transmission is lagging. BPA built no new major transmission lines from 1988-2000. In the last few years, the agency has added just over 150 miles of new

### Regional transmission is not keeping up with needs

	2004	2014	Percent Increase
Winter Peak – megawatts	59,117	66,065	12%
Transmission circuit miles	62,517	64,349	3%

*From NW Power Pool 10 year forecast.*

500-kilovolt transmission, including the Schultz-Wautoma project now under construction, thus expanding its grid by about 1 percent.

Northwest loads are expected to grow 12 percent between 2004-2014; the region's high-voltage grid will expand only 3 percent in that period under current utility plans. That figure includes all the investments BPA is now making.

The net result is an increasingly strained transmission system throughout the West.

## Too many "near misses"

**O**nce, individual utilities readily handled small incidents such as an outage due to a tree growing too close to a line. Now, many parts of the grid are operating close to their limits, and the grid is so interdependent that a small lapse in reliability planning, analysis or operation could result in a single incident cascading into a major blackout.

That's what happened in 1996, where growing trees in Idaho and Oregon caused blackouts in California. There has not been a major blackout in the West since 1996, but there are too many "near misses."

For example, on June 14, 2004, a flock of birds startled from a 230-kilovolt line in Arizona fouled and

caused a fault on that line. Backup systems failed and the fault went unstopped for 39 seconds. This one event tripped out eight 230-kV lines, ten 500-kV lines, 4,610 megawatts of generation and over 1,000 megawatts of load across the Southwest. Fortunately, critical Northwest transmission paths were running half-empty that day and portions of the intertie lines to California were out for routine maintenance, so the incident did not take out loads or generation in the Northwest. Had the system been running closer to capacity that day, it could have.

Falling trees, growing trees, ice from winter storms, smoke from forest fires, wind, lightning – all sorts of natural hazards can take out individual power lines. But with the grid so interconnected and so fully used, small local problems can affect transmission hundreds or thousands of miles away. Pluck a strand here, the grid reverberates all over.

***“We’re running so much tighter:  
There’s less room for errors.”***

Vickie VanZandt  
*BPA senior vice president  
for the Transmission Business Line*

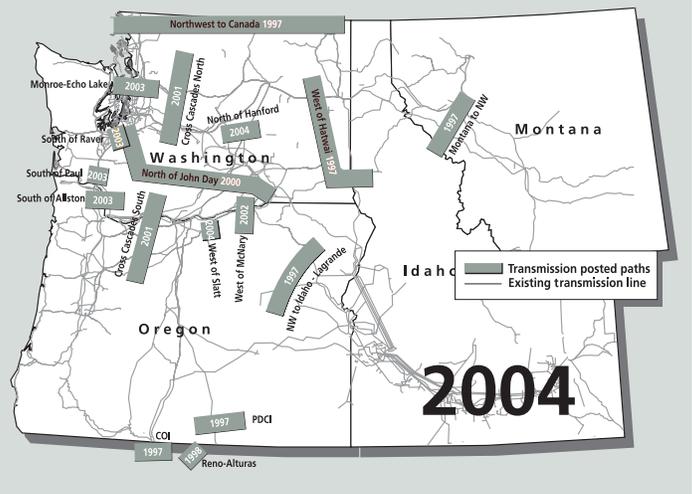
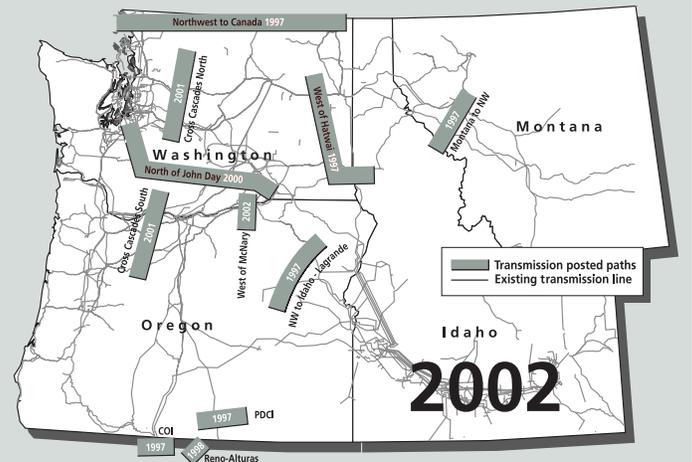
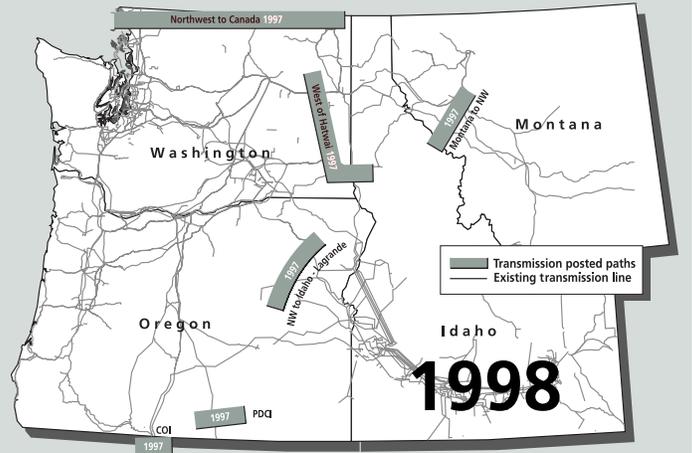
Much has been done;  
more is needed

The West experienced blackouts in 1996 that began when lines sagged toward growing trees on hot days. Utilities, including BPA, responded by increasing their vegetation control, improving control and communication technologies, and setting tighter local and West-wide operating standards.

Some new transmission has been built. BPA recently added new transmission lines to its portion of the grid. The Western Area Power Administration and private utility partners have built a new line on the most-congested part of the California grid between San Jose and Bakersfield, known as Path 15.

## Growing congestion

***Cut planes – points where the grid gets congested – have proliferated in the last few years. More and more transmission paths are reaching their limits.***



## One immense machine

The entire transmission system of Western U.S. states, British Columbia, Alberta and the Baja Peninsula of Mexico is one giant machine. It has dozens of owners, operators and regulators, each of which is responsible for a fragment of the whole.

But electrons do not recognize ownership or other human concepts. They simply follow the path of least resistance. Keeping the lights on means precisely and constantly managing these paths of least resistance throughout the entire grid, regardless of who owns which part, over transmission paths that are often hundreds or even thousands of miles long.

The electricity flow in the grid must at all times precisely match the electricity being withdrawn from it. Every time anyone flips a light switch, a generator responds slightly to match that change in load. Operators in the many control areas of the grid are responsible for keeping their part in balance at all times and for keeping their portion synchronized with all the others at a frequency of 60 cycles a second – 60 hertz. Keeping it all in balance has become more and more difficult in recent years, particularly on the major transmission paths that cross control areas.

***To keep the lights on, the entire transmission grid of the Western U.S. and Canada has to be kept in synch 24-hours-a-day, 365-days-a-year. BPA owns about three-fourths of the high-voltage transmission in its service territory, but less than a third of the transmission in the larger Northwest Power Pool, and a small fraction of the interconnected Western grid.***

These steps have helped, but stresses on the grid have continued to grow. Today, many Northwest transmission paths are congested or fully subscribed. Power plant developers who need new access to transmission often can't get it or must finance new line construction.

In recent years, BPA and other transmission owners have increasingly used a concept called "cutplanes" to pinpoint places in the regional grid that suffer frequent congestion. BPA had identified six BPA cutplanes by 1998. Today, there are at least 15.

When a path exceeds its limit, transmission operators must reduce loads on lines within minutes under predefined curtailment schemes or by redispatching generation. Utilities that had scheduled transmission of power to meet their loads must

scramble to find emergency replacement generation, which is typically expensive. If no replacement generation is available, they may be required to cut load – turn off power to some customers.

## Efficiency

Consolidated grid operation could result in big dollar savings to Northwest consumers. Here are four possibilities:

First, it might be possible to make more existing transmission capacity available by centralizing analysis of planned power flows. Today, each transmission provider reserves transmission paths to meet all its contractual obligations, even though the actual power

may not flow on those paths. Operators may reserve extra transmission capacity to protect themselves from unplanned power flows that may originate on neighboring systems. Central assessment of actual combined power flows should free up capacity that is now being reserved by individual operators for reliability.

Second, some problems could be fixed with a new approach to managing congestion. For example, on paths that are congested just a few hours a year, a central system operator might solve the problem if it could arrange voluntary redispatch of generation or demand-side management for those few hours on each side of the congestion. Switching generation patterns for a few hours would cost much less than increasing transmission capacity and would make more efficient use of the region's resources.

Third, consolidating control areas, even if only among the largest utilities that manage the region's major transmission pathways, would increase efficiency by pooling the utilities' generation reserves for load regulation. Northwest utilities set aside hundreds of megawatts of generating capability to follow the constant short-term fluctuations in electricity use. If utilities shared these routine regulating reserves, they collectively would have to set aside significantly less than they do today.

Fourth, while operation and scheduling of the generation system is planned a day in advance, actual generation must be changed hourly throughout each day to deal with load fluctuations due to weather and other factors. Today, utilities individually adjust their power purchases and generation to meet this "energy imbalance" need. Creation of a voluntary central market that allows parties to bid to supply this need should lower costs to regional consumers.

## Reliability

The reliability of the strained grid is increasingly vulnerable in part because each operator can see only a fragment of what's going on. BPA believes the most promising approach to improvement is a single grid operator working out of one dispatch center with visibility and control of the entire or a large part of the Northwest grid.

Today, each transmission operator is charged with the primary, detailed responsibility for *managing* reliability. Each control system operator directly controls generation and transmission on its part of the system, and is focused on the reliability of that part of the system. The Northwest has a reliability coordinator who *monitors* reliability of the entire grid at a high level and is ready to direct reliability actions that are necessary to restore reliability if the problem can't be solved by the transmission operator(s) directly responsible.

A single grid operator would have a clear view of the entire grid and what's crossing each transmission path and would have an unobstructed ability to *manage* reliability, addressing problems that now require

### The one-utility concept

Utility cooperation has benefited the people and economy of the Pacific Northwest for many decades.

Transmission lines traditionally go from a utility's power plants to its own customers. But, since the 1950s, utilities in the Northwest also have wheeled electricity for other utilities over their transmission lines. For example, about 80 of BPA's Northwest utility customers receive federal power in part over other utilities' lines. BPA routinely wheels other utilities' power over its lines. This cooperative approach has reduced the net investment needed to meet the region's transmission needs.

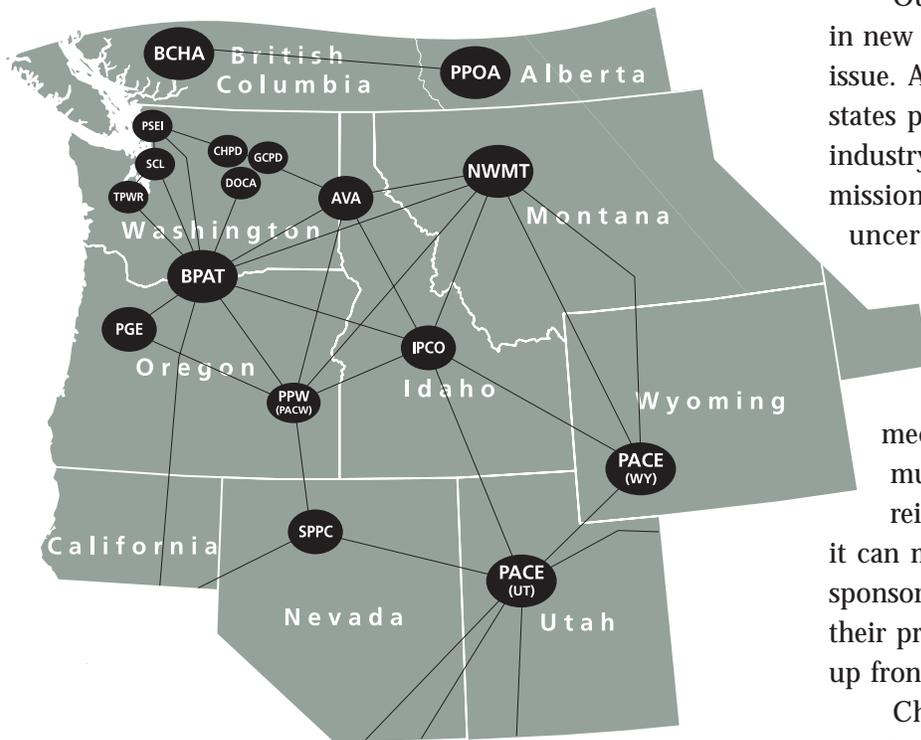
Since the 1970s, the Northwest has also sold and exchanged seasonal surplus electricity with California and Southwest utilities over intertie power lines in ways that more efficiently use the resources of both regions.

One-utility planning goes a step further. Northwest utilities have worked together for decades to make the most of their combined power generation resources. The Columbia River drove this collaboration. Generation at downstream dams reflects upstream water releases. Since 1964, Northwest utilities have coordinated their water releases and fossil fuel generation as if one utility owned all the resources. They also share in providing emergency generation reserves, which makes reliable service after unexpected loss of a generator less costly. In total, this cooperation has increased Northwest utilities' combined useful power production enough to serve a city the size of Seattle.

BPA believes it is time to apply the one-utility principle to Northwest transmission operation and planning.

## Control Areas of the Northwest Power Pool

**Today, 17 different utilities control transmission within the Northwest Power Pool.**



coordination among several operators across separately operated parts of the system.

For example, in the summer of 2003, operators scrambled to reduce an overloaded path between two regions after a key generator tripped off line. While operators reduced transmission schedules, flows did not change – because actual generation was not adjusted. To improve reliability, a regional grid operator would need to be able to direct actual operations for emergency purposes in real time.

A single system operator would act for the good of the system as a whole. Acting alone, an individual plant or control area operator might unknowingly take an action to reduce costs, relieve wear and tear on a generator or change flow on a path – not realizing that this action could destabilize the larger grid. A grid operator with a broader view – particularly as it related to controlling power flow on the major transmission paths – would be able to manage the individual elements for the good of the system as a whole.

## Infrastructure

The infrastructure of the grid as currently managed is barely adequate for today's peak needs and is simply inadequate to meet the needs of the near future.

Outside BPA and a few other instances, investment in new transmission has been lagging. This is a national issue. As the governors of several Rocky Mountain states put it in a recent report, "The electric power industry has been reluctant to invest in new transmission infrastructure due to protracted regulatory uncertainties."

Where power is transmitted over many utilities' lines between source and user, the responsibility for funding new transmission is unclear, and there is no fair, accepted mechanism for assigning costs and benefits among multiple parties. BPA is building only projects that reinforce the reliability of its grid and to ensure it can meet its transmission obligations. Power plant sponsors who need new transmission to integrate their projects into the grid have to put up the money up front.

Changes in the regulation of the electricity industry since 1992 have created new challenges that can hinder joint construction of needed transmission. For example, prior to the requirement for utilities to provide open access to their transmission system, if a utility was considering a major transmission expansion, other parties often requested or demanded that they be allowed to fund and own part of the project to ensure they had access to meet their potential needs. Today, utilities can wait, hoping someone else will construct the facility. Then, if they need access, they can get open access transmission service, typically at embedded cost rates.

From a physics perspective, the grid operates as one large machine, while individual transmission owners make decisions based on their best interests. An independent regional transmission planner could determine what investments best meet the needs of the grid and affected parties as a whole, and evaluate the benefits and allocate costs accordingly.

Today, each transmission owner that invests in transmission, such as BPA, must recover all the costs of

its additions from its own rates, even when neighboring transmission owners benefit. An independent entity could design the least-cost solution for the region, including non-wires solutions such as demand response or distributed generation. Transmission rates should be lower than otherwise because a more regional approach should produce the cheapest solution for the region as a whole. With the ability to make sure construction is done, a regional transmission planner could ensure that needed facilities are built at the lowest overall cost and allocate costs to the beneficiaries.

***“We need a mechanism to ensure needed transmission is built and costs are allocated equitably.”***

Allen Burns  
***BPA executive vice president  
for Industry Restructuring***

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## Options being considered

**T**he Northwest utility community has been talking for more than a decade about how to better run the region’s transmission grid. So far, several major efforts have failed to come to fruition. The parties keep trying because, while finding the best framework for the common good is difficult, the stakes make the effort worthwhile. Here are the major efforts currently in play:

- In December 2004, BPA and representatives of eight other transmission utilities approved bylaws for Grid West, a potential independent regional transmission provider. This followed more than a year of discussion and extensive comments from many regional interests. The parties have agreed to spend about six months fleshing out details of Grid West’s proposed operation before deciding next fall whether to pursue this concept further.
- The Northwest Transmission Assessment Committee or NTAC of Northwest utilities and stakeholders, including BPA, has been working for more than

a year on a voluntary approach to develop a regional transmission plan through the auspices of the Northwest Power Pool.

- A Transmission Issues Group of Northwest utilities is exploring an approach that would build on existing institutions such as NTAC, the Pacific Northwest Security Coordinator, and a widely used transmission reservation service or OASIS known as WestTrans.
- The American Public Power Association recommends joint participation in transmission lines and new generation projects, with ownership proportionate to respective investments.
- BPA circulated a white paper on developing transmission adequacy standards for the Northwest, and plans to use guidance from the resulting standards in producing its own capital plan. In response to public comments, the Northwest Power Pool has agreed to coordinate development of regionwide transmission adequacy standards.
- The Northwest Power and Conservation Council, in its fifth Northwest Power Plan, has agreed to provide a forum for addressing regional resource adequacy standards. This effort will look at the close interdependence of transmission adequacy and generation adequacy in assuring the overall reliability of delivered power.
- The Western Governors’ Association meets regularly to discuss transmission and generation policy.

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## It’s time to pick a path

**T**he National Commission on Energy Policy noted in a December 2004 report that, “The failure to invest in adequate transmission infrastructure is a significant and growing national problem that costs consumers tens of billions of dollars in higher energy costs, lost productivity due to power outages, poor power quality and lack of access to potentially lower-cost power supplies from a diverse mix of resources.”

Northwest utilities have been talking about unifying their transmission grid operation and planning since the mid-1990s. At this point, BPA believes neither

it nor any other existing entity can best plan and operate the full spectrum of Northwest transmission facilities by itself. BPA believes the region needs a new approach to operation and planning of its transmission grid to assure reliability and increase efficiency.

Many utilities and regional stakeholders share this view. Others are convinced that the goal can be achieved through existing institutions. Whether a new entity can be devised that would be worth the cost is an open question, and other issues also need to be resolved. But there is general consensus that the existing framework needs to be improved.

For the next few months, BPA will work to assure that needed Grid West details such as market design and control area consolidation are developed for evaluation. Then, the region can properly consider the proposal and decide whether to further pursue this path.

In this timeframe, we anticipate that the Transmission Issues Group will refine its alternative approach. If this proposal develops to the point that the region believes it holds real promise, BPA will examine it as we consider whether to continue Grid West development or move to an alternative.

It's time to define the options and pick a path. The region will not be well served if we are still discussing potential solutions years from now instead of implementing needed changes. BPA encourages all interested parties to become informed and participate, so that we can decide on a course of action and, together, we can build a reliable, robust future for the Northwest grid.

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## For more information

Additional information can be found at the following Web sites:

***BPA Industry Restructuring Web site***

***<http://www.bpa.gov/corporate/business/restructuring/>***

***Grid West Web site***

***<http://www.gridwest.org/>***

### Stress!

***Operators are seeing the effects of a stressed grid. Here, a minor event in Alberta that operators would have expected to barely register instead caused dramatic power swings at the California-Oregon border:***

